HIGH SURFACE AREA CATHODE FOR ELECTROLYTIC CAPACITORS USING CONDUCTIVE POLYMER

ABSTRACT OF THE DISCLOSURE

The present invention is directed to a conductive polyethylenedioxythiophene (PEDOT) polymer coated electrode adapted for use as a cathode electrode of an electrolytic capacitor and a method of manufacturing the same. According to the present invention, a metal foil substrate is placed in an aqueous solution of a doped 3,4-ethylenedioxythiophene (EDOT) monomer and a co-solvent, to dissolve the EDOT monomer, and a current is applied until the desired thickness of the polymer coating is electrochemically deposited. Additionally, an organic acid is added to the aqueous solution to act as an oxidizer. In order to improve the uniformity and adherence of the coating a surfactant may also be added. In a preferred embodiment, the EDOT monomer and cosolvent are first mixed, and then added to a water solution of oxidizer and dopant. The polymer film is deposited electrochemically onto the substrate by applying a DC current between 0.05 mA/cm^2 and 5.0 mA/cm^2 for 1 to 60 minutes, more preferably between about 0.13 mA/cm^2 to about 0.26 mA/cm^2 for between 9 and 18 minutes, such that a conductive polyethylenedioxythiophene (PEDOT) coating is formed on the electrode surface. According to the present invention, the increased surface area of the coated cathode results in lower gas generation and, therefore, reduced capacitor swelling, reduced oxide buildup on the cathode and prevention of electrolysis. The present invention results in electrodes with a minimum capacitance of 1 mF/cm^2. The present invention also makes it possible to use thinner electrodes than conventional aluminum electrodes, thereby reducing the physical dimensions of the capacitor.